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# G84-693 Protein Levels for Growing and Finishing Cattle

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# Protein Levels for Growing and Finishing Cattle

**This NebGuide describes the use of nonprotein nitrogen and bypass protein sources to fulfill the protein requirements of growing and finishing steers, heifers and bulls.**

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Protein supplementation can be an expensive feed cost for cattle producers. Through the use of nonprotein nitrogen (NPN) and bypass protein sources, however, these costs can be reduced. Bypass protein is the protein that escapes breakdown in the rumen and passes "as is" into the small intestine where it is digested and absorbed. Because NPN sources are usually the most economical sources of supplemental nitrogen, NPN should be used whenever possible. The potential for using NPN depends on the ability of the rumen microorganisms to synthesize protein, the bypass protein supplied by ration ingredients, and the protein requirement of the animal.

## Protein Needs of Finishing Cattle

The protein requirement of finishing cattle declines with age when a greater proportion of their weight gain is fat. Grain supplies a high proportion of the diet protein, and is high in available energy needed to incorporate ammonia nitrogen (from urea) into microbial protein. These factors allow for greater NPN use in finishing rations as compared to growing rations that contain more forage.

High moisture corn may contain less bypass protein than dry corn due to ensiling, and cattle fed high moisture corn may respond slightly to natural protein (soybean meal, alfalfa, cottonseed meal) supplementation, especially during the step-up period. However, there is no need to supplement bypass protein to finishing cattle that are "on feed."

Liquid supplements are excellent carriers for NPN sources (for example, urea) while helping to control dust problems. Some carriers (steep liquor and condensed whey) also supply NPN and are economically comparable to molasses.

Another method of supplementing NPN is in a pelleted dry supplement. Supplementation with natural protein is more expensive than with NPN. The major decision is thus one of cost per unit of supplemental protein and not the source of protein.

**Table I. Protein suggestions for growing-finishing steers.**

| Animal Weight (lb) | Daily Gain (lb) | Frame Score (based on AGNET system) | | |
|---|---|---|---|---|
| | | 2 Hereford-Angus | 3 1/4-3/4 Exotic Cross | 4 7/8-15/16 Exotic Cross |
| | | Total ration protein, % dry basis | | |
| 300-400 | .5-1.0 | 10.0 | 10.5 | 10.5 |
| | 1.0-1.5 | 11.5 | 12.0 | 12.0 |
| | 1.5-2.0 | 13.0 | 13.0 | 13.0 |
| | 2.0-2.5 | 14.0 | 14.0 | 14.0 |
| 400-500 | .5-1.0 | 9.5 | 9.7 | 10.0 |
| | 1.0-1.5 | 10.7 | 10.9 | 11.2 |
| | 1.5-2.0 | 11.5 | 11.7 | 12.0 |
| | 2.0-2.5 | 12.0 | 12.2 | 12.5 |
| 500-600 | .5-1.0 | 9.0 | 9.2 | 9.5 |
| | 1.0-1.5 | 10.5 | 10.7 | 11.0 |
| | 1.5-2.0 | 11.2 | 11.5 | 11.7 |
| | 2.0-2.5 | 11.7 | 12.0 | 12.2 |
| 600-700 | .5-1.0 | 9.0 | 9.2 | 9.5 |
| | 1.0-1.5 | 10.0 | 10.2 | 10.5 |
| | 1.5-2.0 | 10.7 | 10.9 | 11.2 |
| | 2.0-2.5 | 11.2 | 11.5 | 11.7 |
| 700-900 | 2.5-3.5 | 11.0 | 11.2 | 11.5 |
| 900-1300 | 2.5-3.5 | 10.5 | 10.7 | 11.0 |

## Protein Needs of Growing Cattle

Rations for growing calves from weaning to the time for placing them on finishing rations are variable. The calves' requirements for supplemental protein varies depending upon rate of gain. Some feeds, such as green grass, alfalfa or wheat pasture, may have an abundance of rumen degradable protein. Others, such as crop residues and native winter range, may be low in total protein, degradable protein and digestible energy.

A common growing ration is one based on corn silage. Calves supplemented with soybean meal will gain about 0.2 lb/day more than those supplemented with urea. However, economics usually favor supplementing with urea rather than soybean meal. Feeding the correct combination of urea and bypass protein should result in calf performance equal to that of soybean meal, thus reducing the cost of protein

supplementation. Bypass protein-urea combinations will not increase daily gain, but should be cheaper than an all-soybean meal supplement.

In Nebraska, may calves are wintered on native range or crop residues. Calves fed under these conditions may respond to supplementation of rumen degradable protein (see NebGuide G84-694, *New Protein Values for Ingredients Used in Growing Cattle Rations*, for a description of protein sources). Whether the rumen degradable protein is supplying amino acids, peptides or carbon chains is not exactly known. However, research shows that calves fed crop residues will gain faster when supplemented with alfalfa, bypass protein and urea than when they are supplemented with bypass protein and urea.

**Table II. Protein suggestions for growing-finishing heifers.**

| Animal Weight (lb) | Daily Gain (lb) | Frame Score (based on AGNET system) | | |
|---|---|---|---|---|
| | | 2 Hereford-Angus | 3 1/4-3/4 Exotic Cross | 4 7/8-15/16 Exotic Cross |
| | | Total ration protein, % dry basis | | |
| 300-400 | .5-1.0 | 10.0 | 10.5 | 10.5 |
| | 1.0-1.5 | 11.0 | 11.5 | 11.5 |
| | 1.5-2.0 | 13.0 | 13.0 | 13.0 |
| | 2.0-2.5 | 14.0 | 14.0 | 14.0 |
| 400-500 | .5-1.0 | 9.2 | 9.5 | 9.7 |
| | 1.0-1.5 | 10.4 | 10.7 | 10.9 |
| | 1.5-2.0 | 11.2 | 11.5 | 11.7 |
| | 2.0-2.5 | 11.7 | 12.0 | 12.2 |
| 500-600 | .5-1.0 | 8.7 | 9.0 | 9.2 |
| | 1.0-1.5 | 10.2 | 10.5 | 10.7 |
| | 1.5-2.0 | 11.0 | 11.2 | 11.5 |
| | 2.0-2.5 | 11.5 | 11.7 | 12.0 |
| 600-700 | .5-1.0 | 8.7 | 9.0 | 9.2 |
| | 1.0-1.5 | 9.7 | 10.0 | 10.2 |
| | 1.5-2.0 | 10.4 | 10.7 | 10.9 |
| | 2.0-2.5 | 11.0 | 11.2 | 11.5 |
| 700-900 | 2.5-3.5 | 11.0 | 11.0 | 11.2 |
| 900-1300 | 2.5-3.5 | 10.5 | 10.5 | 10.7 |

## Ration Requirements for Protein

Protein requirements for growing and finishing cattle are based on animal weight and daily gain, and were established using average size Hereford-Angus cattle. However, requirements for the different breeds are not clearly defined. Total ration protein requirements for crossbred steers, heifers and bulls are shown in *Tables I, II,* and *III*.

When using AGNET to balance for bypass protein (SOYBEAN MEAL EQUIVALENT) and rumen degradable protein (DEGRADABLE PROTEIN), the operator must make a few changes with the ration requirements. For bypass protein, change the SOYBEAN MEAL EQUIVALENT value from zero to whatever the ration crude protein value is. Also change the UREA ration requirement from zero to some number between 1 and 100. For DEGRADABLE PROTEIN, multiply the crude protein requirement by .25 (or 25%). Now change the DEGRADABLE PROTEIN requirement from zero to this new number. These changes will allow you to balance for bypass protein and degradable protein values.

**Table III. Protein suggestions for growing-finishing bulls.**

| Animal Weight (lb) | Daily Gain (lb) | Frame Score[a] | | |
|---|---|---|---|---|
| | | 2 Hereford-Angus | 3 1/4-3/4 Exotic Cross | 4 7/8-15/16 Exotic Cross |
| | | Total ration protein, % dry basis | | |
| 500-700 | 2-3 | 12.0 | 12.2 | 12.5 |
| | 3-4 | 13.0 | 13.2 | 13.5 |
| 700-900 | 2-3 | 11.0 | 11.2 | 11.5 |
| | 3-4 | 12.0 | 12.2 | 12.5 |
| 900-1100 | 2-3 | 11.0 | 11.2 | 11.5 |
| | 3-4 | 11.5 | 11.7 | 12.0 |
| 1100-1300 | 2-3 | 10.5 | 10.7 | 11.0 |
| | 3-4 | 11.0 | 11.2 | 11.5 |
| 1300-1500 | 2-3 | 10.5 | 10.7 | 11.0 |
| | 3-4 | 10.5 | 10.7 | 11.0 |
| 1500 and greater | 0-1 | 8.5 | 8.5 | 8.5 |

[a]Based on AGNET system except bulls will finish at heavier weights.

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